Amendments to the Claims

This listing of claims will replace all prior versions, and listings, of claims in the application:

Listing of Claims:

1. (currently amended) A disk drive, comprising:

a magnetic disk having an annular data storage region between inner and outer diameters; and

an actuator arm assembly including an actuator arm, a flexure arm mounted on a first end of said actuator arm, and a read element and a write element mounted on an end of said flexure arm opposite said actuator arm, wherein said actuator arm assembly rotates about a second end of said actuator arm opposite said first end of said actuator arm, said read element reads from said disk and said write element writes to said disk;

wherein said read element has a read element skew angle and said write element has a write element skew angle,~~ and~~

wherein at least one of said read element skew angle and said write element skew angle decreases as said read element and said write element move from said inner diameter to said outer diameter and is never less than 45 degrees while said read element and said write element are located over said data storage region, and

wherein the physical widths of said read element and said write element are at least double the effective widths of said read element and said write element at said inner diameter.

2. (previously presented) A disk drive, as claimed in claim 1, wherein said data storage region has a plurality of concentric tracks which include sectors, said sectors including data sectors and servo sectors, and said servo sectors are written in a non-radially coherent manner by said write element due to said write element skew angle.

3. (previously presented) A disk drive, as claimed in claim 1, wherein said data storage region has a plurality of concentric tracks which include sectors, said sectors including data sectors and servo sectors, and said servo sectors are printed on said disk.

4. (previously presented) A disk drive, as claimed in claim 1, wherein at least one of said read element and said write element is mounted on said flexure arm such that at least one of said read element and said write element is not perpendicular to a centerline of said flexure arm, and said centerline of said flexure arm is parallel to a centerline of said actuator arm.

5. (previously presented) A disk drive, as claimed in claim 1, wherein at least one of said read element and said write element is mounted on said flexure arm such that at least one of said read element and said write element is perpendicular to a centerline of said flexure arm, and said flexure arm is mounted on said actuator arm such that said centerline of said flexure arm is not parallel to a centerline of said actuator arm.

6. (previously presented) A disk drive, as claimed in claim 1, wherein at least one of said read element and said write element is mounted on said flexure arm such that at

least one of said read element and said write element is perpendicular to a centerline of said flexure arm, and said flexure arm is mounted on said actuator arm such that said centerline of said flexure arm is parallel to a centerline of said actuator arm.

7. (currently amended) A disk drive, comprising:

a magnetic disk having an annular data storage region extending from an inner diameter to an outer diameter; and

an actuator arm assembly including an actuator arm, a flexure arm mounted on a first end of said actuator arm at a non-zero angle relative to said actuator arm, and a read element and a write element mounted to an end of said flexure arm opposite said actuator arm at a 90 degree angle relative to said flexure arm, wherein said actuator arm assembly rotates about a second end of said actuator arm opposite said first end of said actuator arm, said read element reads from said disk and said write element writes to said disk,

wherein a skew angle of at least one of said read element and said write element relative to said data storage region decreases as said read element and said write element move from said inner diameter to said outer diameter and is never less than 45 degrees within said data storage region, and

wherein the physical widths of said read element and said write element are at least double the effective widths of said read element and said write element at said inner diameter.

8. (cancelled)

9. (previously presented) A disk drive, as claimed in claim 7, wherein said skew angle is greater than 60 degrees at said inner diameter.

10. (previously presented) A disk drive, as claimed in claim 7, wherein said data storage region includes a plurality of concentric tracks which include sectors, said sectors including data sectors and servo sectors, and said servo sectors are written in a non-radially coherent manner by said write element due to said skew angle of said write element.

11. (previously presented) A disk drive, as claimed in claim 7, wherein said data storage region includes a plurality of concentric tracks which include sectors, said sectors including data sectors and servo sectors, and said servo sectors are printed on said disk.

12. (previously presented) A disk drive, as claimed in claim 7, wherein a tolerance of at least one of said read and write elements is increased by the inverse cosine of said skew angle.

13. (previously presented) A disk drive, as claimed in claim 7, wherein an effective width of at least one of said read and write elements is increased by the inverse cosine of said skew angle.

14. (original) A disk drive, as claimed in claim 7, wherein a signal-to-noise ratio produced by said read element is at least 6 dB.

15. (previously presented) A disk drive, as claimed in claim 7, wherein said data storage region includes a plurality of concentric tracks, each of said tracks having a width associated therewith, and the width of said tracks corresponds to the cosine of said skew angle of said write element.

16. (currently amended) A disk drive, as claimed in claim 15, wherein said write element has a first physical width,

wherein the width of said tracks corresponds to the product of said first physical width and the cosine of said skew angle of said write element.

17. (currently amended) A disk drive, comprising:

a magnetic disk having an annular data storage region between inner and outer diameters; and

an actuator arm assembly including an actuator arm, a flexure arm mounted to a first end of said actuator arm, and a read element and a write element mounted to an end of said flexure arm opposite said actuator arm, wherein said actuator arm assembly rotates about a second end of said actuator arm opposite said first end of said actuator arm, said read element reads from said disk and said write element writes to said disk,

wherein a skew angle of at least one of said read and write elements decreases as said read element and said write element move from said inner diameter to said outer diameter, is never less than 45 degrees while said read element and said write element are located within said data storage region and is zero degrees when said read element and said write element are located at a position off of said data storage region, and

wherein the physical widths of said read element and said write element are at least double the effective widths of said read element and said write element at said inner diameter.

18. (previously presented) A disk drive, as claimed in claim 17, wherein at least one of said read element and said write element is mounted on said flexure arm such that at least one of said read element and said write element is perpendicular to a centerline of said flexure arm, and said flexure arm is mounted on said actuator arm such that said centerline of said flexure arm is not parallel to a centerline of said actuator arm.

19. (previously presented) A disk drive, as claimed in claim 17, wherein at least one of said read element and said write element is mounted on said flexure arm such that at least one of said read element and said write element is perpendicular to a centerline of said flexure arm, and said flexure arm is mounted on said actuator arm such that said centerline of said flexure arm is parallel to a centerline of said actuator arm.

20. (previously presented) A disk drive, as claimed in claim 17, wherein said data storage region includes a plurality of concentric tracks which include sectors, said sectors including data sectors and servo sectors, and said servo sectors are written in a non-radially coherent manner by said write element due to said skew angle of said write element.

21. (previously presented) A disk drive, as claimed in claim 17, wherein said data storage region includes a plurality of concentric tracks which include sectors, said sectors including data sectors and servo sectors, and said servo sectors are printed on said disk.

22. (currently amended) A disk drive, as claimed in claim 17, wherein said read element has a first physical width and said write element has a second physical width, and a tolerance of at least one of said first and second physical widths is increased by the inverse cosine of said skew angle.

23. (original) A disk drive, as claimed in claim 22, wherein a signal-to-noise ratio produced by said read element is at least 6 dB.

24. (previously presented) A disk drive, as claimed in claim 17, wherein said data storage region includes a plurality of concentric tracks, and the width of said tracks corresponds to the cosine of said skew angle of said write element.

25. (previously presented) A disk drive, as claimed in claim 17, wherein said read element has a first effective width and said write element has a second effective width, and at least one of said first and second effective widths is increased by the inverse cosine of said skew angle.

26. (currently amended) A disk drive, comprising:

a magnetic disk having an annular data storage region including a plurality of concentric tracks between inner and outer diameters; and

an actuator arm assembly including an actuator arm, a flexure arm mounted on a first end of said actuator arm, and a head mounted on an end of said flexure arm opposite said actuator arm, said head having a read element and a write element, wherein said actuator arm assembly rotates about a second end of said actuator arm opposite said first end of said actuator arm, said read element reads from said disk and said write element writes to said disk,

wherein a skew angle of said read element and write element relative to said tracks decreases as said head moves from said inner diameter to said outer diameter and is at least 60 degrees at said inner diameter and at least 20 degrees at said outer diameter, and

wherein the physical widths of said read element and said write element are at least double the effective widths of said read element and said write element at said inner diameter.

27. (previously presented) A disk drive, as claimed in claim 26, wherein said skew angle at said inner diameter is at least 45 degrees.

28. (cancelled)

29. (cancelled)

30. (previously presented) A disk drive, as claimed in claim 26, wherein said tracks include sectors, said sectors including data sectors and servo sectors, and said servo sectors are written in a non-radially coherent manner by said write element due to said skew angle.

31. (previously presented) A disk drive, as claimed in claim 26, wherein said tracks include sectors, said sectors including data sectors and servo sectors, and said servo sectors are printed on said disk.

32. (currently amended) A disk drive, comprising:

a magnetic disk having a data storage region including a plurality of concentric tracks between inner and outer diameters in which all data in said data storage region is recorded, said tracks having associated track widths; and

an actuator arm assembly including an actuator arm, a flexure arm mounted on a first end of said actuator arm, and a head mounted on an end of said flexure arm opposite said actuator arm, said head having a read element and a write element, wherein said actuator arm assembly rotates about a second end of said actuator arm opposite said first end of said actuator arm, said read element reads from said disk and said write element writes to said disk,

wherein the physical width of at least one of said write element and said read element is greater than said track width for each of said tracks, ~~and~~

wherein a skew angle of said head relative to said tracks decreases as said head moves from said inner diameter to said outer diameter and is not less than 45 degrees at said inner diameter, and

wherein the physical widths of said read element and said write element are at least double the effective widths of said read element and said write element at said inner diameter.

33. (previously presented) A disk drive, as claimed in claim 32, wherein said tracks include sectors, said sectors including data sectors and servo sectors, and said servo sectors are written in a non-radially coherent manner by said write element due to said skew angle.

34. (previously presented) A disk drive, as claimed in claim 32, wherein said tracks include sectors, said sectors including data sectors and servo sectors, and said servo sectors are printed on said disk.

35. (original) A disk drive, as claimed in claim 32, wherein said head is mounted on said flexure arm such that at least one of said read element and said write element is not perpendicular to a centerline of said flexure arm.

36. (previously presented) A disk drive, as claimed in claim 32, wherein said skew angle is zero degrees when said head is located at a position off of said data storage region.

37. (cancelled)

38. (cancelled)

39. (previously presented) A disk drive, as claimed in claim 32, wherein said skew angle is greater than 60 degrees at said inner diameter.

40. (previously presented) A disk drive, as claimed in claim 32, wherein said head is mounted on said flexure arm such that said head is not perpendicular to a centerline of said flexure arm, and said flexure arm is mounted on said actuator arm such that said centerline of said flexure arm is parallel to a centerline of said actuator arm.

41. (currently amended) A disk drive, as claimed in claim 32, wherein said head is mounted on said flexure arm such that said head is perpendicular to a centerline of said flexure arm, and said flexure arm is mounted on said actuator arm such that said centerline of said flexure arm is not parallel to a centerline of said actuator arm.

42. (cancelled)

43. (cancelled)

44. (currently amended) A disk drive, as claimed in claim 41, wherein said head is mounted on said flexure arm such that said head is perpendicular to a centerline of said

flexure arm, and said flexure arm is mounted on said actuator arm such that said centerline of said flexure arm is parallel to a centerline of said actuator arm.

45. (currently amended) A method for increasing the tolerance of a read element in a disk drive, comprising:

providing a head having said read element that reads from a magnetic disk, said read element having a nominal width and a width tolerance; and

skewing said read element to a skew angle of 45 degrees or more at each track located in a data storage region of said disk such that said width tolerance is increased by approximately the inverse cosine of said skew angle, wherein said skew angle decreases as said head moves from an inner diameter to an outer diameter of said disk, and said nominal width is at least double an effective width of said read element at said inner diameter.

46. (previously presented) A method, as claimed in claim 45, wherein said skewing step includes:

selecting said skew angle such that said width tolerance is increased by at least 30 percent.

47. (previously presented) A method, as claimed in claim 45, wherein said skewing step includes:

selecting said skew angle such that said width tolerance is increased by at least 50 percent.

48. (previously presented) A method, as claimed in claim 45, wherein said skewing step includes:

selecting said skew angle such that said width tolerance is increased by at least 100 percent.

49. (currently amended) A method for increasing head element physical widths in a disk drive, said disk drive having a data storage region with a radial extent between inner and outer diameters, comprising:

providing a head having a read element having a first physical width and a write element having a second physical width, wherein said read element reads from said data storage region and said write element writes to said data storage region; and

skewing said head at a skew angle of 45 degrees or more throughout the radial extent of the data storage region, such that said read element has a first effective width and said write element has a second effective width, wherein said first and second effective widths are reduced compared to said first and second physical widths and said skew angle is increased as said head moves from said outer diameter to said inner diameter, and said first and second effective widths are at most one-half said first and second physical widths at said inner diameter.

50. (original) A method, as claimed in claim 49, further comprising:

reducing a track width to correspond to said first and second effective widths.

51. (previously presented) A method, as claimed in claim 49, wherein said skewing step includes:

selecting said skew angle such that said first and second effective widths are 70 percent of said first and second physical widths.

52. (previously presented) A method, as claimed in claim 51, wherein said skewing step includes:

selecting said skew angle such that said first and second effective widths are 60 percent of said first and second physical widths.

53. (previously presented) A method, as claimed in claim 49, wherein said skewing step includes:

selecting said skew angle such that said first and second effective widths are 50 percent of said first and second physical widths.

54. (currently amended) A method for decreasing track widths on magnetic media in a disk drive, comprising:

providing a head having an element for reading from or writing to tracks located in a data storage region of said magnetic media between inner and outer diameters of said magnetic media, said element having a nominal width;

skewing said element to a skew angle of 45 degrees or more relative to each track such that an effective width of said element relative to said tracks is reduced as compared to said nominal width and said skew angle is increased as said head moves from said

outer diameter to said inner diameter and said effective width is at most one-half said nominal width at said inner diameter; and

selecting a track width of said tracks to correspond to said effective width.

55. (original) A method, as claimed in claim 54, further comprising:

selecting said skew angle such that said track width is narrower than said nominal width.

56. (original) A method, as claimed in claim 54, wherein said selecting step includes:

reducing said track width relative to a nominal track width which corresponds to said nominal width.

57. (original) A method, as claimed in claim 56, wherein said reducing step includes:

reducing said track width by at least 30 percent.

58. (original) A method, as claimed in claim 56, wherein said reducing step includes:

reducing said track width by at least 40 percent.

59. (original) A method, as claimed in claim 56, wherein said reducing step includes:

reducing said track width by at least 50 percent.

60. (previously presented) A disk drive, as claimed in claim 1, wherein said read element and said write element are located on a head which is substantially rectangular in shape.

61. (previously presented) A disk drive, as claimed in claim 7, wherein said read element and said write element are located on a head which is substantially rectangular in shape.

62. (previously presented) A disk drive, as claimed in claim 17, wherein said read element and said write element are located on a head which is substantially rectangular in shape.

63. (previously presented) A disk drive, as claimed in claim 26, wherein said head is substantially rectangular in shape.

64. (previously presented) A disk drive, as claimed in claim 32, wherein said head is substantially rectangular in shape.

65. (previously presented) A method, as claimed in claim 45, wherein said head is substantially rectangular in shape.

66. (previously presented) A method, as claimed in claim 49, wherein said head is substantially rectangular in shape.

67. (previously presented) A method, as claimed in claim 54, wherein said head is substantially rectangular in shape.

68. (currently amended) A disk drive, comprising:

a magnetic disk including concentric tracks and inner and outer diameters; and

an actuator arm assembly including an actuator arm, a flexure arm mounted on a first end of said actuator arm, and a head mounted on an end of said flexure arm opposite said actuator arm, said head having a read element and a write element, wherein said actuator arm assembly rotates about a second end of said actuator arm opposite said first end of said actuator arm, said read element reads from said disk and said write element writes to said disk,

wherein a skew angle of said head relative to said tracks decreases as said head moves from said inner diameter to said outer diameter, thereby increasing the effective widths of said read and write elements relative to the physical widths of said read and write elements as said head moves from said inner diameter to said outer diameter, ~~and~~ said skew angle is at least 45 degrees at said inner diameter and at least 20 degrees at said

outer diameter, and said physical widths are at least double said effective widths at said inner diameter.

69. (previously presented) A disk drive, as claimed in claim 68, wherein said skew angle is at least 60 degrees at said inner diameter.

70. (previously presented) A disk drive, as claimed in claim 68, wherein said skew angle is at least 45 degrees at said outer diameter.

71. (previously presented) A disk drive, as claimed in claim 68, wherein said skew angle is at least 60 degrees at said inner diameter and at least 45 degrees at said outer diameter.

72. (previously presented) A disk drive, as claimed in claim 68, wherein said skew angle is approximately 65 degrees at said inner diameter and approximately 45 degrees at said outer diameter.

73. (previously presented) A disk drive, as claimed in claim 68, wherein said skew angle is approximately 60 degrees at said inner diameter and approximately 20 degrees at said outer diameter.

74. (currently amended) A disk drive, as claimed in claim 68, wherein said physical widths are ~~at least~~ double said effective widths at said inner diameter.

75. (previously presented) A disk drive, as claimed in claim 68, wherein said head is mounted on said flexure arm such that said head is not perpendicular to a centerline of said flexure arm, and said flexure arm is mounted on said actuator arm such that said centerline of said flexure arm is parallel to a centerline of said actuator arm.

76. (currently amended) A disk drive, as claimed in claim 68, wherein said head is mounted on said flexure arm such that said head is perpendicular to a centerline of said flexure arm, and said flexure arm is mounted on said actuator arm such that said centerline of said flexure arm is not parallel to a centerline of said actuator arm.

77. (currently amended) A disk drive, as claimed in claim 68, wherein said head is mounted on said flexure arm such that said head is perpendicular to a centerline of said flexure arm, and said flexure arm is mounted on said actuator arm such that said centerline of said flexure arm is parallel to a centerline of said actuator arm.

78 (new) A disk drive, comprising:

a magnetic disk having an annular data storage region between inner and outer diameters; and

an actuator arm assembly including an actuator arm, a flexure arm mounted on a first end of said actuator arm, and a read element and a write element mounted on an end of said flexure arm opposite said actuator arm, wherein said actuator arm assembly rotates about a second end of said actuator arm opposite said first end of said actuator arm, said read element reads from said disk and said write element writes to said disk;

wherein said read element has a read element skew angle and said write element has a write element skew angle,

wherein at least one of said read element skew angle and said write element skew angle decreases as said read element and said write element move from said inner diameter to said outer diameter and is never less than 45 degrees while said read element and said write element are located over said data storage region, and

wherein at least one of said read element and said write element is mounted on said flexure arm such that at least one of said read element and said write element is perpendicular to a centerline of said flexure arm, and said flexure arm is mounted on said actuator arm such that said centerline of said flexure arm is not parallel to a centerline of said actuator arm.

79. (new) A disk drive, comprising:

a magnetic disk having an annular data storage region between inner and outer diameters; and

an actuator arm assembly including an actuator arm, a flexure arm mounted to a first end of said actuator arm, and a read element and a write element mounted to an end of said flexure arm opposite said actuator arm, wherein said actuator arm assembly rotates about a second end of said actuator arm opposite said first end of said actuator arm, said read element reads from said disk and said write element writes to said disk,

wherein a skew angle of at least one of said read and write elements decreases as said read element and said write element move from said inner diameter to said outer diameter, is never less than 45 degrees while said read element and said write element are

located within said data storage region and is zero degrees when said read element and said write element are located at a position off of said data storage region, and

wherein at least one of said read element and said write element is mounted on said flexure arm such that at least one of said read element and said write element is perpendicular to a centerline of said flexure arm, and said flexure arm is mounted on said actuator arm such that said centerline of said flexure arm is not parallel to a centerline of said actuator arm.

80. (new) A disk drive, comprising:

a magnetic disk having a data storage region including a plurality of concentric tracks between inner and outer diameters in which all data in said data storage region is recorded, said tracks having associated track widths; and

an actuator arm assembly including an actuator arm, a flexure arm mounted on a first end of said actuator arm, and a head mounted on an end of said flexure arm opposite said actuator arm, said head having a read element and a write element, wherein said actuator arm assembly rotates about a second end of said actuator arm opposite said first end of said actuator arm, said read element reads from said disk and said write element writes to said disk,

wherein the width of at least one of said write element and said read element is greater than said track width for each of said tracks,

wherein a skew angle of said head relative to said tracks decreases as said head moves from said inner diameter to said outer diameter and is not less than 45 degrees at said inner diameter, and

wherein said head is mounted on said flexure arm such that said head is perpendicular to a centerline of said flexure arm, and said flexure arm is mounted on said actuator arm such that said centerline of said flexure arm is not parallel to a centerline of said actuator arm.

81. (new) A disk drive, comprising:

a magnetic disk including concentric tracks and inner and outer diameters; and

an actuator arm assembly including an actuator arm, a flexure arm mounted on a first end of said actuator arm, and a head mounted on an end of said flexure arm opposite said actuator arm, said head having a read element and a write element, wherein said actuator arm assembly rotates about a second end of said actuator arm opposite said first end of said actuator arm, said read element reads from said disk and said write element writes to said disk,

wherein a skew angle of said head relative to said tracks decreases as said head moves from said inner diameter to said outer diameter, thereby increasing the effective widths of said read and write elements relative to the physical widths of said read and write elements as said head moves from said inner diameter to said outer diameter, and said skew angle is at least 45 degrees at said inner diameter and at least 20 degrees at said outer diameter, and

wherein said head is mounted on said flexure arm such that said head is perpendicular to a centerline of said flexure arm, and said flexure arm is mounted on said actuator arm such that said centerline of said flexure arm is not parallel to a centerline of said actuator arm.